



Fact Sheet:

Electromagnetic (EM) Shielding Materials-Gaskets and Seals

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The Problem

Electromagnetic interference (EMI), electromagnetic pulse (EMP), and radio frequency interference (RFI) can disrupt and potentially damage sensitive military communication and electronic equipment in critical Command, Control, Communications, Computer, and Intelligence (C4I) facilities. Electromagnetic (EM) shielding can protect against such damage as well as against the leakage of classified electronic communications and high levels of EM signature.

EM shielding is accomplished by placing an electrically conductive surface between the source of an EM disturbance and the region to be protected. This may be achieved by either shielding the EM source, the sensitive facility, or both. The shield must attenuate the undesired signals to an acceptable level.

Penetrations and joints or seams in the enclosure must be treated to preserve shielding effectiveness.

Electrically conductive EM gasket materials seal the seams, access ports, and doors of shielded enclosures to maintain shielding integrity. Long-term performance is an important consideration. Testing has shown that the electrical conductivity of many of these gasketing materials is weakened by exposure to the environment. This loss of conductivity at an electromagnetically shielded interface can significantly reduce the enclosure's shielding effectiveness.

The demand for high-quality EM gasket material is limited. Consequently, commercial gasket manufacturers have placed little emphasis on producing the types of gaskets needed to meet specialized military needs.

The Technology

The U.S. Army Construction Engineering Research Laboratories (CERL) is investigating new materials and processes for EM shielding applications. Researchers have tested available EM gasket materials in a field/operational environment. Testing required the development of fixtures for wear simulation, the comparative evaluation of electrical properties as a function of corrosion, and the microscopic evaluation of gasket construction and coating materials. The metal surfaces to which these gaskets are electrically mated were also evaluated for their impact on the gasket's loss of conductivity. A major conclusion of the study was that the quality of the mating surface coating determines the performance of the EM gasket system. Several gasket/mating surface designs and materials were proposed to solve the problem.

Benefits/Savings

The military services can directly use the results of these programs in the design, specification, and procurement of the next generation of shielded enclosures. One result of CERL's effort is that major improvements in the EM gasket system can now be implemented easily. CERL will continue efforts to further refine the gasket and mating surface coatings to minimize current maintenance and replacement requirements.

Status

CERL has been designated the lead laboratory for EM shielding research under the Survivability and Protective Structures subarea of the Tri-Service Civil Engineering Project Reliance. CERL experts have provided EM shielding technical support to numerous Federal agencies.

CERL has also been involved in the EM shielding of transportable tactical shelters which have shielding challenges similar to those of permanent structures. CERL representatives have participated in the Technical Working

Group of the Joint Committee on Tactical Shelters, providing technical support for EMI/RFI/EMP shielding of tactical shelters to the Air Force Shelter Technology Office. The Air Force Shelter Technology Office has sponsored investigations of EM gaskets and seals for tactical shelter applications. Advanced coating research for EM shielded interfaces includes investigations of conventional metals, unconventional metals/surface treatments, amorphous metals, and electrically conductive ceramic coatings such as titanium nitride. Research efforts include using ion plating and post plating surface treatments to produce more durable gasket surfaces with improved electrical properties over existing products.

Points of Contact

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